Inventory No.: OS6273

ROC		PHONE CALL		CONFERENCE	DATE: 02/28/12
	X	DISCUSSION		FYI	TIME: 4:00 pm

TO: FILE FROM: Ray Leissner

SUBJECT: Recommendation for area CO2/water flood permit #06S124P6273 for wells in the area encompassed by the SE/4 of Section 10, the S/2 of Section 11, the SW/4 of Section 12, all of Section 14, and the N/2 of Section 23, of the Township 27N, Range 5E for Chaparral Energy, L.L.C.

PERMIT REQUEST: The operator has requested an area permit to convert wells to an enhanced oil recovery project in the North Burbank Field, Burbank Sand formation. The permit will allow the operator to convert existing wells or construct new wells for injection anywhere within the permitted area at their discretion. The wells will alternate injection of primarily salt water, polymer and carbon dioxide (CO_2) and minor amounts of fresh or brackish water. The CO_2 injected may contain incidental amounts of constituents, such as, hydrogen sulfide (H_2S), nitrogen (N_2) and oxygen (O_2), intrinsic to anthropogenic CO_2 and hydrocarbon gases intrinsic to the field production and recycle of CO_2 produced water.

This is the first of its kind permit for an EPA DI program in the nation. Going in to the development of the permit we consulted with other Regions and took conservative approaches to ensure protection of the ground water. This includes increased well construction standards for new and existing wells, a first of its kind area wide GW monitoring system with the flexibility to focus on potential trouble spots, and increased notification and reporting requirements. All designed to provide feedback in a timely fashion on the appropriateness of the standards adopted and approaches taken in this permit to protect the USDW.

For existing wells, cement shall be placed behind all casing strings, from the top of the Burbank Sand to a height of at least 500 feet above the top of the Burbank Sand. The outermost casing(s) through underground sources of drinking water (USDWs) shall be cemented to a depth of at least 50 feet below the base of USDW. For the initial permit area, the base of the USDW is set at 245 feet subsurface. Should this permit be amended in the future to add additional areas, new depths to the base of the USDW will be specified for each area. For those existing wells without surface casing or whose surface casing is too shallow to allow 50 feet of cement below the

USDW the top 500 feet of the outermost casing(s) must be cemented to surface.

Newly drilled wells shall be constructed with surface casing set to at least 500 feet subsurface and cemented back to surface. Long-string casing shall be set at least to the top of the Burbank Sand formation, and cemented back to surface. If cement is not circulated on the long-string casing, a cement bond log or temperature survey shall be run and submitted to the Section Chief showing bonding of at least 5oo feet directly above the Burbank formation.

Injection in all wells will be through tubing and packer set to within 75' of the production zone. All cements, casings, liners, tubings, packers and tubing-casing annulus fluids employed shall be designed to withstand the anticipated acidic environment. All wells shall be equipped with standard female fittings with cut-off valves affixed to the wellhead in a manner that allows opportunity to detect pressure in each annulus between the tubing and surface casing.

All construction requirements will be verified. The permit provides performance based standards for both construction and mechanical testing requirements. Absence of upward migration will be confirmed with either a temperature or radioactive survey. Internal mechanical integrity (MI) will be confirmed by pressure tests.

The permit requires a network of monitoring wells to be constructed to encompass the permit area and may be repositioned to enhance detection of fluid migration into USDWs. This system shall include one monitor well to be placed within 50 feet of the intersection of all quarter sections in the permit area. If the permittee cannot locate or implement effective corrective action on any well of record requiring corrective action, the Chief may reposition a monitoring well to within 25 feet from the recorded location of the subject well. Activation of the monitoring well grid across the area shall proceed in advance of the injection activity authorized under this permit.

The Burbank Sand was initially reported as under-pressured in the application. The fluid level on one existing well open to the Burbank Sand formation was taken and reported to be at 1233'. This implies an initial reservoir pressure of approximately 845 psi. Since the application was submitted the applicant has been injecting primarily salt water to increase reservoir pressure to sustain CO2 in its supercritical form. Ideal reservoir pressure is estimated around 1026 psi. The permeability was reported at 96 md and the porosity is reported at 17%.

An examination of the projected pressure influence of a 20 year traditional salt water disposal operation and a pan system examination of super critical / gas phase injection were conducted. They revealed no concerns.

While each approach is considered conservative in the results produced, neither is considered adequate for the proposed injection due to the areal extent of the activity. Therefore, as an enhanced recovery project, engaging multiple injection sources, alternating water and supercritical fluid injection, and simultaneously engaging production sinks in the production zone area, pressure influence is assumed to be great enough to impact the USDW anywhere within ¼ mile outside the permit area. This conservative assumption is incorporated in the permit's corrective action standards and applied to all artificial penetrations throughout the permit area and ¼ mile buffer zone.

RECOMMENDATIONS & CONCLUSIONS: The permit will allow the operator to inject, into each well he successfully converts or constructs in the permit area, a maximum volume of saltwater of 124,000 barrels per calendar month at a maximum pressure of 850 psig and/or a maximum volume of 186 million cubic feet (MMCF) per calendar month of anthropogenic CO2 at a maximum pressure of 2165 psig. Based on compliance with the permit's corrective action requirements for all artificial penetrations in the permit area and buffer zone, and the nominal pressure influence projected by the injection of the individual fluid phases, the proposed enhanced recovery project should not endanger the USDW. If this assertion proves wrong, the monitoring well system and reporting requirements in the permit should expose the need for any additional corrective actions in a timely fashion. The permit is recommended for approval.